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*RESEARCH PAPER*

# Study of cost effective layout of drip for brinjal (*Solanum melongena* L.)

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**Abstract :** The treatment combination $S_3I_1F_1$ [planting geometry $S_3$ 175 - 50 x 50 cm with irrigation level $I_1$ 100% $ET_{crop}$ and fertigation level $F_1$-100% RDF through drip (WSF)] recorded higher values of fruit yield (49.8 t $ha^{-1}$), highest grosss income (Rs. 4,48,420 $ha^{-1}$) and maximum B:C ratio (2.61) over the rest of treatment combinations. The lowest values of fruit yield (27.4 t ha-1), gross income (Rs. 2,46,360 $ha^{-1}$) and B:C ratio (1.31) was noticed under treatment combination of $S_1I_3F_2$ of plant spacing 75x75cm with irrigation level 60 per cent $ET_{crop}$ and fertigation level 80 per cent RDF through drip (WSF). While the control $C_2$ (surface irrigation with 1.0 IW/CPE ratio) showed lowest average values of fruit yield (12.8 t $ha^{-1}$), gross income (Rs. 1,15,310 $ha^{-1}$) and B:C ratio (1.04).

**Key Words :** Cost, Gross income, B:C ratio, Planting density, Irrigation levels, Fertigation levels, Brinjal

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## INTRODUCTION

Drip irrigation is an efficient and useful method of water application. Under the situation of labour crises drip irrigation can save water, increase the crop production, minimizes the labour dependence and further it saves the cost of management. This system is often preferred over the conventional irrigation methods because of high water application efficiency on account of reduced losses, surface evaporation and deep percolation.

Efficient use of fertilizers and water is highly critical to sustained agricultural production, more particularly in the context of declining per capita land and water availability and increasing cost of fertilizers. Under these circumstances, fertigation, which is a sophisticated and efficient means of applying fertilizer through irrigation system as a carrier and distributor of crop nutrients, holds bright promise. As the fertilizer is costly input, the saving of fertilizers can be achieved by adopting the fertigation that reduces the losses through leaching, volatization and or fixation in the soil to less available forms and increases the fertilizer use efficiency (Papadopoulos, 1995). Application of water soluble fertilizers through drip by means of fertigation is gaining importance in present day agriculture to boost the production and productivity of vegetable crops.

The initial cost for installation of drip system is very

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high but change in planting geometry is cost free input which helps to reduce cost of laterals and emitters to the extent of 20 to 30 per cent as well as improve the quality and production of crop (Pawade and Satpute, 1987)

Therefore, the study was undertaken to increase the yield potential of brinjal with designing the cost effective layout of drip in combination of different planting density, irrigation and fertigation levels.

## MATERIAL AND METHODS

A field experiment was conducted during *Rabi-hot* weather of 2009-2010 at Department of Agronomy, College of Agriculture, Dapoli, Dist. Ratnagiri (M.S.). The soil of experimental field was sandy clay loam in texture and moderately acidic in reaction, medium in available N, low in available $P_2O_5$ and high in $K_2O$ content. The experiment was laid out in Split Plot Design consisted of three planting density *viz.*, ($S_1$-75x75cm, $S_2$-75-50 x 90cm, $S_3$-175-50x50cm) and three irrigation levels ($I_1$-100 % ET crop, $I_2$-80 % ET crop, $I_3$-60% ET crop). The sub plot treatments comprised of two fertigation levels *viz.*, [$F_1$-100 % RDF through drip (WSF), $F_2$-80 % RDF through drip (WSF)]. Thus, these eighteen treatments combinations were replicated thrice. There were two controls (check basin) with manual application of recommended dose of fertilizer ($C_1$) and without fertilizer ($C_2$) in combination of surface irrigation at 1.0 IW/CPE ratio which kept separated beside main and submain treatments. The transplanting was done for three different spacing *i.e.* 75x75cm, 75-50 x 90cm, 175-50 x 50cm in case of drip irrigation system and 75 x 75cm in case of check basin to maintain uniform plant population per hectare. The irrigation was scheduled based on pan evaporation of previous two days (Ep), pan factor (Kp), stage wise crop co-efficient (Kc), wetted area for brinjal (Aw). For check basin, irrigation was applied to the crop with depth of 5 cm, IW/CPE=1.0. For the experimental treatments fertigation was given in three split doses. The N, P and K were given at interval

**Table 1 : Input cost, total cost, yield of fruit (t ha$^{-1}$), gross income, net income and B:C ratio of different treatment combination**

| Treatment combinations | Input cost (Rs. ha$^{-1}$) | Total cost (Rs. ha$^{-1}$) | Yield (t ha$^{-1}$) | Gross income (Rs. ha$^{-1}$) | Net income (Rs. ha$^{-1}$) | B:C ratio |
|---|---|---|---|---|---|---|
| $S_1I_1F_1$ | 104678 | 197873 | 34.8 | 313205 | 115332 | 1.58 |
| $S_1I_1F_2$ | 101672 | 195121 | 31.3 | 281955 | 86834 | 1.45 |
| $S_1I_2F_1$ | 103452 | 196435 | 32.5 | 292464 | 96029 | 1.49 |
| $S_1I_2F_2$ | 100117 | 192073 | 28.9 | 260077 | 68004 | 1.35 |
| $S_1I_3F_1$ | 102563 | 194062 | 30.5 | 274164 | 80102 | 1.41 |
| $S_1I_3F_2$ | 99236 | 188034 | 27.4 | 246360 | 58326 | 1.31 |
| $S_2I_1F_1$ | 92345 | 190234 | 41.9 | 376840 | 189509 | 2.01 |
| $S_2I_1F_2$ | 89234 | 188231 | 38.1 | 342666 | 155668 | 1.83 |
| $S_2I_2F_1$ | 91231 | 189765 | 39.5 | 355597 | 165943 | 1.87 |
| $S_2I_2F_2$ | 88590 | 187331 | 35.8 | 322406 | 134175 | 1.71 |
| $S_2I_3F_1$ | 90654 | 189654 | 37.0 | 332873 | 142639 | 1.75 |
| $S_2I_3F_2$ | 87452 | 186998 | 33.7 | 303518 | 113753 | 1.60 |
| $S_3I_1F_1$ | 77857 | 171764 | 49.8 | 448420 | 276656 | 2.61 |
| $S_3I_1F_2$ | 75646 | 169654 | 45.2 | 406548 | 236894 | 2.40 |
| $S_3I_2F_1$ | 76545 | 170345 | 46.6 | 419603 | 249258 | 2.46 |
| $S_3I_2F_2$ | 73217 | 167456 | 42.5 | 382380 | 213922 | 2.27 |
| $S_3I_3F_1$ | 74353 | 168458 | 44.1 | 396888 | 229836 | 2.38 |
| $S_3I_3F_2$ | 72453 | 167052 | 40.4 | 363717 | 196665 | 2.18 |
| $C_1$ (RDF) | 110448 | 190093 | 26.7 | 240116 | 50023 | 1.26 |
| $C_2$ | 71300 | 111030 | 12.8 | 115310 | 4280 | 1.04 |

of 30, 60 and 90 DAT through 19:19:19 grade and remaining quantity of N was given through urea by calculating the quantity of fertilizer. For control $C_1$ (100 % RDF through soil application) 1/3rd quantity of N and 100 per cent P, K was applied as a basal dose and remaining 2/3rd quantity of N was applied at 30, 60 and 90 DAT through manual application of solid fertilizers *viz.*, urea, SSP and MOP. For control $C_2$ no fertilizer was given which kept as absolute control. Total yield of each net plot was calculated by summation of weight of fruit per net plot from all pickings. The grand total of each plot was converted on hectare basis (t $ha^{-1}$).

## RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

**Economics of the crop :**

The results in (Table 1) reveals that the highest total cost (Rs. 1,97,873 $ha^{-1}$) was recorded under treatment combination $S_1I_1F_1$ (spacing of 75x75cm with 100% ETcrop and 100% RDF through drip). The lowest total cost (Rs.1,67,052 $ha^{-1}$) of production was recorded by treatment combination of $S_3I_3F_2$ (spacing of 175-50 x 50cm with 60 % ETcrop and 80% RDF through drip) among the all treatment combinations.

The maximum yield (49.8 t $ha^{-1}$) was recorded by treatment combination $S_3I_1F_1$ (spacing of 75x75cm with 100% $ET_{crop}$ and 100% RDF through drip). The lowest value of yield (27.4 t $ha^{-1}$) was registered under the treatment combination $S_1I_3F_2$ [spacing of 75x75cm with 60% $ET_{crop}$ and 80% RDF through drip (WSF)]. While the control $C_1$ (100% RDF through soil application in combination of surface irrigation with 1.0 IW/CPE ratio) and $C_2$ (surface irrigation with 1.0 IW/CPE ratio) showed reduced average values of yield 26.7 and 12.8 t $ha^{-1}$, respectively.

The highest gross income was recorded under treatment combination $S_3I_1F_1$ (spacing of 175-50 x 50cm with 100% $ET_{crop}$ and 100% RDF through drip) *i.e.* (Rs. 4,48,420 $ha^{-1}$). While the lowest gross income (Rs. 2,46,360 $ha^{-1}$) was observed in treatment combination $S_1I_3F_2$ (spacing of 75x75cm with 60% $ET_{crop}$ and 80% RDF through drip). While the control $C_1$ (100% RDF through soil application in combination of surface irrigation with 1.0 IW/CPE ratio) and $C_2$ (surface irrigation with 1.0 IW/CPE ratio) showed reduced average values of gross income (Rs. 2,40,116 $ha^{-1}$) and (Rs.1,15,310 $ha^{-1}$), respectively.

The highest B:C ratio was observed under treatment combination $S_3I_1F_1$ (spacing of 175-50x50cm with 100 % $ET_{crop}$ and 100% RDF through drip) *i.e.* 2.61. The lowest benefit cost ratio observed in $S_1I_3F_2$ (spacing of 75x75 cm with 60 % $ET_{crop}$ and 80% RDF through drip) *i.e.* 1.31. While the control $C_1$ (100% RDF through soil application in combination of surface irrigation with 1.0 IW/CPE ratio) and $C_2$ (surface irrigation with 1.0 IW/CPE ratio) showed less average values of B:C ratio (1.26) and (1.04), respectively. Similar results were reported by Thakur *et al.* (1995); Shinde *et al.* (2002); Tumbare and Bhoite (2002); Anonymous (2003); Firake and Pawar (2004); Kunjir (2004) and Patel *et al.* (2006).

**Conclusion :**

The highest fruit yield (49.8 t $ha^{-1}$), highest net income (Rs. 2,76,656 $ha^{-1}$) and maximum B:C ratio (2.61) were recorded under the treatment combination of plant spacing of $S_3$-175-50 x 50cm with irrigation level $I_1$-100 per cent $ET_{crop}$ and fertigation level $F_1$-100 per cent RDF through drip (WSF) which was found to be superior over the rest of treatment combinations.

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